PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

To:

United States Patent and Trademark Office
(Box PCT)
Crystal Plaza 2
Washington, DC 20231
ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 08 May 1998 (08.05.98)	
International application No. PCT/US97/15892	**Applicant's or agent's file reference** 1003-PCT
International filing date (day/month/year) 08 September 1997 (08.09.97)	**Priority date** (day/month/year) 09 September 1996 (09.09.96)
Applicant DUPRAY, Dennis, Jay et al	

1. The designated Office is hereby notified of its election made:

   [X] in the demand filed with the International Preliminary Examining Authority on:

   08 April 1998 (08.04.98)

   [ ] in a notice effecting later election filed with the International Bureau on:

2. The election [X] was

   [ ] was not

   made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer N. Fischer Telephone No.: (41-22) 338.83.38

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Replaced by Article 34 Amend

PATENT COOPERATION TREATY

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 1003-PCT	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/US97/15892	International filing date *(day/month/year)* 08 SEPTEMBER 1997	Priority date *(day/month/year)* 09 SEPTEMBER 1996
International Patent Classification (IPC) or national classification and IPC IPC(6): G01S 3/02 and US Cl.: 342/457		
Applicant DUPRAY, DENNIS JAY		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 4 sheets.

☐ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority. (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 32 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of report with regard to novelty, inventive step or industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
08 APRIL 1998	20 JULY 1998
Name and mailing address of the IPEA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer for THEODORE BLUM Telephone No. (703)305-1833

Form PCT/IPEA/409 (cover sheet) (January 1994)*

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/US97/15892

I. Basis of the report

1. This report has been drawn on the basis of (*Substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments*):

☐ the international application as originally filed.

☒ the description, pages (See Attached) , as originally filed.
pages _____ , filed with the demand.
pages _____ , filed with the letter of _____.
pages _____ , filed with the letter of _____.

☒ the claims, Nos. (See Attached) , as originally filed.
Nos. _____ , as amended under Article 19.
Nos. _____ , filed with the demand.
Nos. _____ , filed with the letter of _____.
Nos. _____ , filed with the letter of _____.

☒ the drawings, sheets/~~fig~~ (See Attached) , as originally filed.
sheets/~~fig~~ _____ , filed with the demand.
sheets/~~fig~~ _____ , filed with the letter of _____.
sheets/~~fig~~ _____ , filed with the letter of _____.

2. The amendments have resulted in the cancellation of:

☒ the description, pages None.

☒ the claims, Nos. 48-124.

☒ the drawings, sheets/~~fig~~ None.

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the ~~Supplemental Box~~ Additional observations below (Rule 70.2(c)).

4. Additional observations, if necessary:

NONE

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/US97/15892

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. STATEMENT

Novelty (N)	Claims	1-47	YES
	Claims	None	NO
Inventive Step (IS)	Claims	1-47	YES
	Claims	None	NO
Industrial Applicability (IA)	Claims	1-47	YES
	Claims	None	NO

2. CITATIONS AND EXPLANATIONS

Claims 1-47 meet the requirements under PCT Article 33(2-4) because the claimed method and structure for locating a wireless mobile station is not taught or fairly suggested by the prior art.

---------- NEW CITATIONS ----------

NONE

Supplemental Box
(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of: Boxes I - VIII

I. BASIS OF REPORT:

This report has been drawn on the basis of the description,
pages, 1-186, as originally filed.
pages, NONE, filed with the demand.
and additional amendments:
NONE

This report has been drawn on the basis of the claims,
numbers, NONE, as originally filed.
numbers, NONE, as amended under Article 19.
numbers, NONE, filed with the demand.
and additional amendments:
Claims 1-47, filed with the letter of 01 July 1998.

This report has been drawn on the basis of the drawings,
sheets, 1-54, as originally filed.
sheets, NONE, filed with the demand.
and additional amendments:
NONE

1. A method for locating a wireless mobile station using wireless signal measurements obtained from transmissions between said mobile station and a plurality of base stations capable of wirelessly detecting said mobile station, comprising:

providing first and second mobile station location estimators, wherein said location estimators provide location estimates of said mobile station when said location estimators are supplied with data obtained from wireless signal measurements obtained from transmissions between said mobile station and the base stations, wherein:

(A) said first location estimator performs one or more of the techniques when supplied with said wireless signal measurements:

(a) a triangulation technique to determine, for each of three or more of the base stations, one of: a distance and a wireless signal angle of arrival between the mobile station and the base station using the wireless signal measurements;

(b) a learning technique, wherein said learning technique determines an association for associating:

the wireless signal measurements, and data indicative of a location for the mobile station, wherein said association is determined by a training process using a plurality of data pairs, each said pair including: first information

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indicative of a location of some mobile station, and second information from wireless signal measurements between said some mobile station and one or more of the base stations when said some mobile station is at the location;

(c) a stochastic technique, wherein each said stochastic technique uses a statistical correlation for correlating:

the wireless signal measurements, and

data indicative of a location for the mobile station,

wherein said correlation is used for determining a probability that the mobile station is within an area, and

(B) for at least a particular one of said techniques performed by said first location estimator, said second location estimator does not perform said particular technique when supplied with said wireless signal measurements;

first supplying said first location estimator with first data obtained from the wireless signal measurements;

first generating, by said first location estimator, first location related information having at least a first estimate for the mobile station's location;

second supplying said second location estimator with second data obtained from the wireless signal measurements;

second generating, by said second location estimator, second location related information having at least a second estimate for the mobile station's location;

determining a resulting location estimate of the mobile station using: (a) a first value obtained from said first location related information, and (b) a second value obtained from said second location related information.

2. A method as claimed in Claim 1, further including a step of receiving said measurements during a wireless communication between said mobile station and said plurality of base stations for contacting an emergency response center.

3. A method as claimed in Claim 2, further including a step of transmitting said resulting location estimate to the emergency response center during said wireless communication.

4. A method as claimed in Claim 1, wherein said step of providing includes:

transmitting through a telecommunications network, said first location estimator from a source site to a site having said second location estimator;

operably integrating said first location estimator with said second location estimator for performing at least said step of determining.

5. A method as claimed in Claim 4, wherein said step of transmitting includes sending an encoding of said first location estimator using the Internet.

6. A method as claimed in Claim 1, further including a step of retrieving at least one of (a1) and (b1):

(a1) first historical location data having: (i) a first set of historical location estimates generated by said first location estimator for wireless signal measurements obtained from transmissions between one or more mobile stations and said plurality of base stations at a first plurality of locations, wherein a distance between at least one of said location estimates of said first set, and said first estimate of said mobile station's location is determined to be less than a first predetermined value, and (ii) data identifying said locations of said first plurality of locations;

(b1) second historical location data having: (i) a second set of historical location estimates generated by said second location estimator for wireless signal measurements obtained from transmissions between one or more mobile stations and said plurality of base stations at a second plurality of locations, wherein a distance between at least one of said location estimates of said second set, said second estimate of said mobile station's location is

determined to be less than a second predetermined value, and (ii) data identifying said locations of said second plurality of locations.

7. A method as claimed in Claim 1, further including, for at least one location estimate of said first and second estimates, a step of obtaining one of a likelihood value and a probability that a location of said mobile station is in said one location estimate, wherein said likelihood value is obtained using historical location estimates generated by the location estimator that generated said one location estimate when the location estimator is supplied with wireless signal measurements obtained from transmissions between one or more mobile stations and said plurality of base stations at a plurality of locations.

8. A method as claimed in Claim 1, wherein said step of providing includes providing some one mobile station location estimator, wherein said one mobile station location estimator generates an estimate of where said mobile station is unlikely to be located.

9. A method as claimed in Claim 1, wherein said wireless signal measurements are obtained from transmissions between said mobile station and said plurality of base stations, wherein said transmissions occur within an interval of time wherein one of: said mobile station is expected to be in substantially a same

location, and said interval is less than a predetermined duration.

10. A method as claimed in Claim 1, wherein one of: said first data includes said second estimate, and said second data includes said first estimate.

11. A method as claimed in Claim 1, further including:

performing a first simulation for predicting a likelihood of said mobile station being at said first estimate, wherein said simulation uses pairs of location representations, a first member of each pair including a location estimate obtained from said first location estimator and a second member of the pair including a representation of an independently determined location of a mobile station used for obtaining wireless signal measurements that are obtained from transmissions with said plurality of base stations.

12. A method as claimed in Claim 1, wherein at least one of said first and second location estimators each utilize one of the following:

(a) a pattern recognition location technique for estimating a location of said mobile station by recognizing a pattern of characteristics of said data obtained from wireless signal measurements;

(b) a mobile base station estimator for estimating a location of said mobile station from location

information received from a mobile base station detecting wireless transmissions of said mobile station;

(c) a coverage area location technique for estimating a location of said mobile station by intersecting wireless coverage areas for different sets of one or more of said base stations;

(d) a negative logic location for estimating where said mobile station is unlikely to be located.

13. A method as claimed in Claim 1, wherein at least one of the following holds:

(a) said learning technique is capable of providing an artificial neural network for generating a mobile station location estimate by training said artificial neural network to recognize a pattern of characteristics of location information obtained from said wireless signal measurements;

(b) said triangulation technique is capable of providing the distances between the mobile station and said three or more of the base stations using one or more of: a wireless signal time of arrival, a wireless signal time difference of arrival, a wireless signal strength indication;

(c) said stochastic technique is capable of providing said statistical correlation using one of:

principle decomposition, least squares, partial least squares, and Bollenger Bands.

14. A method as claimed in Claim 1, wherein said first location estimator includes an artificial neural network, wherein said artificial neural network is one of: a multilayer perceptron, an adaptive resonance theory model, and radial basis function network.

15. A method as claimed in Claim 1, wherein said step of determining includes deriving a likelihood measurement that said mobile station is in said resulting location estimate, wherein said likelihood measurement is dependent upon a first likelihood measurement that said mobile station is in said first estimate, and a second likelihood measurement that said mobile station is in said second estimate.

16. A method as claimed in Claim 1, further including a step of deriving one of said first estimate, said second estimate, and said resulting location estimate using one of:

(a) an expected maximum velocity of said mobile station;

(b) an expected maximum acceleration of said mobile station;

(c) an expected route of said mobile station.

17. A location system for locating a mobile station, wherein said mobile station is one of a plurality of mobile

stations, and wireless signal measurements are capable of being obtained from wireless transmissions between the plurality of mobile stations and a plurality of base stations, the improvement characterized by:

one or more location estimators, each said location estimator for estimating a location for each of one or more individual mobile stations of the plurality of mobile stations, when said location estimator is supplied with data from a set of said wireless signal measurements obtained from wireless transmissions between the individual mobile station and said plurality of base stations;

an archive for storing a plurality of data item collections, wherein for each geographical location of a plurality geographical locations, there is one of said data item collections having (a1) and (a2):

(a1) a representation of the geographical location, and

(a2) wireless signal measurements corresponding to one of the plurality of mobile stations transmitting from approximately the geographical location of (a1);

a performance estimator for determining, for each one of said location estimators, corresponding one or more performance measurements indicative of a previous performance of said one location estimator in locating one or more of the plurality of mobile stations, wherein said corresponding performance measurements are determined using

location estimates generated by said one location estimator when said set of (a2), for some of said data item collections, is supplied to said one location estimator;

a controller for activating a group of at least one of said location estimators for generating corresponding location estimates of said mobile station when a first said set of wireless signal measurements is obtained from wireless transmissions between said mobile station and said plurality of base stations, wherein one or more location hypotheses are generated, each said location hypothesis having:

(b1) an hypothesized location estimate of said mobile station obtained using the corresponding location estimate generated by a location estimator of said group,

(b2) a likelihood value indicating a likelihood of said mobile station being at a location represented by said hypothesized location estimate of (b1), wherein said corresponding performance measurements for said location estimator providing the location estimate of (b1) are used in determining said likelihood value;

a location estimator for determining a resulting location estimate of said mobile station, said resulting location estimate being derived using said hypothesized location estimates and said likelihood values from said one or more location hypotheses.

18. A method as claimed in Claim 17, further including a step of transmitting said resulting location estimate to an emergency response center during a wireless communication wherein said first set of wireless signal measurements is obtained.

19. A location system as claimed in Claim 17, further including an hypothesis estimate generator for generating one of said hypothesized location estimates using a time series of location estimates for said mobile station output by said one or more location estimators.

20. A method for locating a mobile station, wherein said mobile station is one of a plurality of mobile stations, and wireless signal measurements are capable of being obtained from wireless transmissions between the plurality mobile stations and a network of base stations, wherein said base stations in the network are cooperatively linked for providing wireless communication with each of the mobile stations, the improvement characterized by:

providing a mobile station location estimator for estimating locations of one or more individual mobile stations of said plurality of mobile stations when said location estimator is supplied with said wireless signal measurements obtained from wireless transmissions between the individual mobile station and said network of base stations;

storing a plurality of data item collections, wherein for each of a plurality of geographical locations, there is one of said data item collections having:

(a1) a representation of the geographical location, and

(a2) a representation of said wireless signal measurements between one of the mobile stations and the base stations when said one mobile station is approximately at the geographical location of (a1);

generating, from said wireless signal measurements between said mobile and said base stations, an initial location estimate of said mobile;

obtaining a first set of one or more additional location estimates generated by said location estimator, wherein each said additional location estimate is generated from said representations of wireless signal measurements of (a2) for one of said data item collections, and wherein at least a majority of said additional location estimates are within a predetermined distance of said initial location estimate;

deriving an adjusted location estimate from said initial location estimate using a second set of said geographical location representations of (a1) for said data item collections whose representations of wireless signal measurements of (a2) were used to generate one of said additional location estimates of said set.

21. A method as claimed in Claim 20, wherein said step of deriving includes determining an area boundary of said adjusted location estimate as a function of said geographical locations in said second set.

22. A location system for locating mobile stations from received wireless signal measurements obtained from transmissions between said mobile stations and a network of base stations, wherein said base stations in the network are cooperatively linked for providing wireless communication, the improvement characterized by:

one or more location estimators for estimating locations of said mobile stations, such that for each of said mobile stations, when said location estimators are supplied with measurements of wireless signals obtained from transmissions between:

the mobile station, at a corresponding geographical location from which the mobile station is transmitting, and

said network of base stations,

at least one location estimate is generated;

a location estimate adjuster for deriving a first adjusted location estimate from a first location estimate generated by a first of said location estimators supplied with said wireless signal measurements obtained from transmissions between: (i) a particular one of said mobile

stations, at a particular location, and (ii) said base stations, wherein:

(a1) said first adjusted location estimate has a corresponding confidence value indicative of a likelihood of the particular geographical location being a location represented by the first adjusted location estimate,

(a2) said first adjusted location estimate is determined using additional location estimates generated: (i) previously to the generation of said first initial location estimate, and (ii) by said first location estimator;

a most likely estimator for determining a most likely location estimate of the particular geographical location of the particular mobile station, said most likely location estimate being derived using said first adjusted location estimate and its corresponding confidence value.

23. A location system, as claimed in Claim 22, wherein, said location estimate adjuster includes a statistical simulation module for deriving a one or more likelihood values indicative of said first location estimator generating mobile station location estimates that include their corresponding geographical locations.

24. A location system, as claimed in Claim 22, wherein, said most likely estimator includes a probability density function for fuzzifying at least said confidence

value for said first adjusted location estimate over an area outside of said first adjusted location estimate.

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25. A location system for locating mobile stations from received wireless signal measurements obtained from transmissions between said mobile stations and a network of fixed location transceivers, wherein said transceivers in the network are cooperatively linked for providing wireless communication with said mobile stations, the improvement characterized by:

an archive for storing a plurality of data item collections, wherein for each location of a plurality geographical locations, there is one of said data item collections having (a1) and (a2):

(a1) a representation of the geographical location,

(a2) a set of said wireless signal measurements obtained from transmissions between one of said mobile stations and said fixed location transceivers, wherein the one mobile station transmits from approximately the geographical location;

a plurality of trainable location estimators, each said trainable location estimator for generating a geographical location estimates for said mobile stations, wherein for each said trainable location estimator:

(b1) there is a corresponding group of wireless signal measurement parameters, wherein for said trainable location estimator to generate a location

estimate of an individual one of said mobile stations, at least some of said parameters must be instantiated with values obtained from transmissions between said individual mobile station and said fixed location transceivers,

(b2) there is a different corresponding group of wireless signal measurement parameters for another of said trainable location estimators, and

(b3) said trainable location estimator learns by associating, for each of at least some of said data item collections, said geographical location representation (a1) of the data item collection with said set of said wireless signal measurements (a2) of the data item collection;

a location estimator selector for selecting one or more of said plurality of trainable location estimators for generating mobile station location estimates, wherein when each of said selected location estimators has its corresponding group of wireless signal measurement parameters instantiated with values obtained from transmissions between one of said mobile stations and said fixed location transceivers, said selected location estimator generates a location estimate of the one mobile station;

wherein for locating a particular one of said mobile stations, said location estimator selector selects a

particular set of said trainable location estimators whose corresponding group of wireless signal measurement parameters can have at least some said parameters instantiated using wireless signal measurements obtained from transmissions between said particular mobile station and said fixed location transceivers;

a location estimator for determining a resulting location estimate of said particular mobile station, said location estimator receiving location estimates from trainable location estimators of said particular set.

26. A location system, as claimed in Claim 25, wherein at least one of said trainable location estimators includes an artificial neural network.

27. A method as claimed in Claim 25, further including a different trainable location estimator utilizing a different artificial neural network for generating a different geographical location estimate of said one mobile station.

28. A method as claimed in Claim 26, wherein said artificial neural network is one of: a multilayer perceptron, an adaptive resonance theory model, and radial basis function network.

29. A method as claimed in Claim 25, wherein said trainable location estimator utilizes an artificial neural network with an input neuron for receiving a value related to wireless transmissions between said particular mobile

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station and a particular one of said fixed location transceivers, wherein said value is indicative of at least one of the following conditions:

(a) said particular transceiver is active for wireless communication with said particular mobile station and a pilot signal by said particular transceiver is detected by said particular mobile station;

(b) said particular transceiver is active for wireless communication with said particular mobile station and said particular transceiver detects wireless transmissions by said particular mobile station;

(c) said particular transceiver is active for wireless communication with said particular mobile station and said particular transceiver does not detect wireless transmissions by said particular mobile station;

(d) said particular transceiver is active for wireless communication with said particular mobile station and said particular mobile station does not detect wireless transmissions by said particular transceiver;

(e) said particular transceiver is not active for wireless communication with said particular mobile station.

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30. A location system for receiving wireless signal measurements of wireless signals transmitted between a plurality mobile stations and a network of base stations, wherein said base stations in the network are cooperatively linked for providing wireless communication, the improvement characterized by:

a plurality of mobile station location estimators for estimating locations of said mobile stations, such that when said location estimators are supplied with said measurements of wireless signals transmitted between one of the mobile stations and said network of base stations, said location estimators output corresponding initial location estimates of a geographical location of said one mobile station, wherein at least two of said mobile station location estimators of said plurality of mobile station location estimators include a different one of the following (a) through (f):

(a) a pattern recognition component for estimating a location of said one mobile station from a pattern in the wireless signal measurements of transmissions between the network and said one mobile station;

(b) a trainable mobile station location estimating component for estimating a location of said one mobile station, wherein said trainable mobile station location estimating component is capable

Sub A5 cont

of being trained to associate: (i) each location of a plurality of geographical locations with (ii) corresponding measurements of wireless signals transmitted between a specified one of said mobile stations and the network, wherein said specified mobile station is approximately at the location;

(c) a triangulation component for estimating a location of said one mobile station, wherein said triangulation component utilizes said measurements of wireless signals between said one mobile station and three of the base stations for triangulating a location estimate of said one mobile station;

(d) a statistical component utilizing a statistical regression technique for estimating a location of said one mobile station;

(e) a mobile base station component for estimating a location of said one mobile station, wherein said mobile base station component utilizes location information received from a mobile base station that detects said one mobile station;

(f) a negative logic component for estimating an area of where said one mobile station is unlikely to be located; and

a most likely estimator for determining a most likely location estimate of said one mobile station, said most likely location estimate being a function of said plurality of location estimates.

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31. A location system, as claimed in Claim 30, wherein one or more of said mobile station location estimators are capable of being at least one of: added, replaced and deleted by Internet transmissions between said location system and a site remote from said location system.

32. A location system for receiving wireless signal measurements of wireless signals transmitted between a plurality mobile stations and a network of base stations, wherein said base stations in the network are cooperatively linked for providing wireless communication, the improvement characterized by:

a mobile station location providing means for estimating locations of said mobile stations, such that when said providing means is supplied with said measurements of wireless signals transmitted between a particular one of the mobile stations and said network of base stations, said providing means determines a first collection of one or more location estimates for said particular mobile station;

an expert system for activating expert system rules for one of: (a) modifying one of said location estimates of

said first collection, and (b) obtaining additional location estimates of the particular location;

a most likely estimator for determining a most likely location estimate of the particular location, said most likely location estimate being a function of one or more location estimates provided by said expert system.

33. A location system for locating wireless mobile stations that communicate with a plurality of networked base stations, comprising:

a wireless transceiver means: (a) for at least detecting a direction of wireless signals transmitted from a wireless mobile station, and (b) for communicating with said networked base stations information related to a location of said wireless mobile station;

a means for detecting whether a detected wireless signal from said mobile station has been one of: reflected and deflected;

a means for estimating a location of said mobile station by using wireless signals transmitted from said mobile station that are not detected by said means for detecting as one of: reflected and deflected.

34. A location system as claimed in Claim 33, wherein said means for detecting includes a means for comparing: (a) a distance of said mobile station from said mobile location system using a signal strength of said wireless signals from said mobile station, and (b) a distance of

said mobile station from said location system using a signal time delay measurement of wireless signal from said mobile station.

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35. A location system as claimed in Claim 33, further including

one or more location estimators for estimating a location of said location system, wherein said at least one of said location estimators uses wireless signals transmitted from one of: said networked base stations and a global positioning system.

36. A location system as claimed in Claim 35, further including

a deadreckoning means for estimating a change in a location of said location system, wherein said deadreckoning means provides incremental updates to said one or more location estimates of said mobile location system output by said at least one location estimator.

37. A method for locating a particular wireless mobile station using measurements of particular wireless signals, wherein at least one of: said measurements and said particular wireless signals are transmitted between said wireless mobile station and at least one of a plurality of transceivers, wherein said transceivers are capable of at least wireless detection of a plurality of wireless transmitting mobile stations including said particular mobile station, comprising:

providing a first and second mobile station location estimators, wherein each of said location estimators is capable of providing a location estimate for each mobile station of at least some of said mobile stations when said location estimator is supplied with corresponding data obtained from received wireless signal measurements communicated between the mobile station and one or more of said plurality of transceivers, wherein:

said first location estimator performs one or more triangulation techniques, wherein each said triangulation technique determines for each of one or more of said mobile stations, and for each transceiver of a set of three or more of said transceivers, a distance between the mobile station, and said transceiver, each said distance determined from data resulting from received measurements of wireless signals communicated between the mobile station and said transceiver, and

said second location estimator does not perform any said triangulation technique;

first supplying said first location estimator with first corresponding data obtained from received wireless signal measurements communicated between said particular mobile station and one or more of said plurality of transceivers;

sub a5 cont

second supplying said second location estimator with second corresponding data obtained from received wireless signal measurements communicated between said particular mobile station and one or more of said plurality of transceivers;

first generating, by said first location estimator, first location related information having at least a first estimate for the mobile station's location;

second generating, by said second location estimator, second location related information having at least a second estimate for the mobile station's location;

determining a resulting location estimate of the mobile station using: (a) a first value obtained from said first location related information, and (b) a second value obtained from said second location related information.

38. A method for locating a particular wireless mobile station using measurements of particular wireless signals, wherein at least one of: said measurements and said particular wireless signals are transmitted between said wireless mobile station and at least one of a plurality of transceivers, wherein said transceivers are capable of at least wireless detection of a plurality of wireless transmitting mobile stations including said particular mobile station, comprising:

providing a first and second mobile station location estimators, wherein each of said location estimators is

capable of providing a location estimate for each mobile station of at least some of said mobile stations when said location estimator is supplied with corresponding data obtained from received wireless signal measurements communicated between the mobile station and one or more of said plurality of transceivers, wherein:

said first location estimator performs one or more global positioning techniques, wherein each said global positioning technique determines for each of one or more of said mobile stations; corresponding data resulting from received measurements of wireless signals from one or more global positioning satellites, said corresponding data for determining a location of the mobile station, and

said second location estimator does not perform any said global positioning technique;

first supplying said first location estimator with first corresponding data obtained from wireless signal measurements communicated between said particular mobile station and one or more of said plurality of transceivers;

second supplying said second location estimator with second corresponding data obtained from wireless signal measurements communicated between said particular mobile station and one or more of said plurality of transceivers;

Sub Q5 cont

first generating, by said first location estimator, first location related information having at least a first estimate for said particular mobile station's location;

second generating, by said second location estimator, second location related information having at least a second estimate for said particular mobile station's location;

determining a resulting location estimate of said particular mobile station using: (a) a first value obtained from said first location related information, and (b) a second value obtained from said second location related information.

39. A method for locating a particular wireless mobile station using measurements of particular wireless signals, wherein at least one of: said measurements and said particular wireless signals are transmitted between said wireless mobile station and at least one of a plurality of transceivers, wherein said transceivers are capable of at least wireless detection of a plurality of wireless transmitting mobile stations including said particular mobile station, comprising:

providing a first and second mobile station location estimators, wherein each of said location estimators is capable of providing a location estimate for each mobile station of at least some of said mobile stations when said location estimator is supplied with corresponding data

Sub 95 cont'd

obtained from received wireless signal measurements communicated between the mobile station and one or more of said plurality of transceivers, wherein:

said first location estimator performs one or more coverage area analysis techniques, wherein each said coverage area analysis technique determines for each of one or more of said mobile stations, an area: (i) included in a corresponding coverage area for each of one or more of said transceivers that detect the mobile station, and (ii) excluded from a corresponding coverage area for each of one or more of said transceivers that can not detect the mobile station, and

said second location estimator does not perform any said coverage area analysis technique;

first supplying said first location estimator with first corresponding data obtained from wireless signal measurements communicated between said particular mobile station and one or more of said plurality of transceivers;

second supplying said second location estimator with second corresponding data obtained from wireless signal measurements communicated between said particular mobile station and one or more of said plurality of transceivers;

generating, by said first and a second of said location estimators, respectively, first and second different

Sub A8 cont.

initial location estimates of said particular mobile station;

determining a location estimate of said particular mobile station as a function of at least one of: (a) said first and second initial location estimates, and (b) a rating of said first and second initial location estimates.

40. A method for locating a wireless mobile station capable of wireless communication with a plurality of base stations, comprising:

providing a plurality of mobile station location estimators, wherein said location estimators provide different location estimates of said mobile station when said location estimators are supplied with location information derived from signal measurements that are transmitted between said mobile station and said plurality of base stations;

receiving measurements of wireless signals transmitted: (a) from one or more global positioning satellites, and (b) between said wireless mobile station and said plurality of base stations;

first generating, by a first of said location estimators, a first time series of one or more location estimates of said mobile station when at least a portion of said measurements are obtained for global positioning satellite signals;

second generating ,by a second of said location estimators, a second time series of one or more location estimates of said mobile station when at least a portion of said measurements provide measurements of wireless signals transmitted between said mobile station and at least one of base stations of said plurality of base stations;

determining a resulting time series of one or more resulting location estimates of said mobile station, wherein for each time of said resulting time series when one of said resulting location estimates is derived, said derivation uses at least one location estimate: (a) that is most recently generated by said first location estimator, and (b) that is most recently generated by said second location estimator.

41. A method as claimed in Claim 40, wherein said step of determining includes:

establishing a priority between said first initial location estimate and said second initial location estimate.

42. A method as claimed in Claim 41, wherein said step of establishing includes obtaining a confidence value corresponding to at least one of said first initial location estimate and said second initial location estimate, wherein each said confidence value is indicative of a likelihood of said mobile station being its said corresponding initial location estimate.

43. A method as claimed in Claim 41, wherein said step of establishing includes using a first time value associated with said first initial location estimate, and a second time value associated with said second initial location estimate.

44. A method as claimed in Claim 40, wherein said step of determining includes preferring said first initial location estimate over said second initial location estimate when both are available for substantially a same location of said mobile station.

45. A method as claimed in Claim 40, wherein said step of receiving includes receiving a first portion of said measurements in a first time period and a second portion of said measurements in a second time period different from said first time period, wherein said first portion is obtained from a global positioning satellite, and said second portion is derived from wireless signals transmitted between said mobile station and at least one of base station of said first plurality of base stations.

46. A method as claimed in Claim 40, wherein said mobile station is in a vehicle and said step of determining uses deadreckoning estimates of changes in the location of the vehicle.

47. A method as claimed in Claim 40, wherein said step of determining includes evaluating one or more constraints related to one or more of: a velocity of said

mobile station, an acceleration of said mobile station, an estimated location of said mobile station in relation of a terrain of said estimated location.